REMARKS

The Office Action dated April 27, 2005, has been carefully reviewed and the following remarks are made in consequence thereof.

Claims 1-20 are pending in this application. Claims 1-8 stand rejected. Claims 9-20 have been canceled.

The objection to the drawings under 37 CFR 1.83(a) because they fail to show Z_p, $Z_{unknown}$, X_1, X_2, R_1, R_1, L_1, and L_2 as described in the specification is respectfully traversed. Each of Z_p, $Z_{unknown}$, X1, X2, R1, R1, L1, and L2 represents an electrical parameter of components described in the specification and shown in the figures.

Specifically, as described at paragraph [0012], lines 5-9:

> [t]he electrical impedance measured at the conditioning circuitry is the electrical combination of target 30, transducer 12 including sensing coil 14 and cable 15, an extension cable, if there is one, (not shown) and the circuitry of system 10. This impedance is usually called the "tank impedance" or parallel impedance (Z_p).

Accordingly, Z_p is described as an electrical characteristic of the electrical combination of the target, the transducer including the sensing coil and the cable, an extension cable, if used, and the circuitry of the system, and is not a structural detail such as a component designation that should be shown in a drawing.

$Z_{unknown}$ is described at paragraph [0014], lines 1-3 as "an unknown dynamic transducer impedance of the transducer having a value $Z_{unknown}$."

X1, X2, R1, R1, L1, and L2 are described at paragraph [0031], lines 1-4 as being restive, inductive and impedance characteristics of the cable and the transducer at two different frequencies f1 and f2 such that the impedance at f1, X1=(R1+jωL1) and the impedance at f2, X2=(R2+jωL2).

Applicants respectfully submit that one skilled in the art after reading the specification light of the figures would understand that the electrical parameters Z_p, $Z_{unknown}$, X_1, X_2, R_1, R_1, L_1, and L_2 represents an electrical characteristic of components described in the specification and shown in the figures, but are not a structural details that should be shown in

the figures. Accordingly, for the reasons stated above, Applicants respectfully request the objection to the drawings be withdrawn.

The objection to the drawings under 37 CFR 1.83(a) because the look up table of inductive gap versus parallel impedance is not shown in the figures is respectfully traversed. Specifically, Claims 7 and 8 have been amended to recite "parallel impedance gap." Figure 3 illustrates and the corresponding specification text describes a look-up table of parallel impedance gap versus inductive gap that includes an x-axis that represents parallel impedance gap and a y-axis that represents inductive gap. Accordingly, for the reasons stated above, Applicants respectfully request the objection to the drawings be withdrawn.

The objection to the drawings because trace 310 is not shown in Figure 3 is respectfully traversed. Specifically, Figure 3 has been revised to show trace 310. A replacement sheet incorporating the revision to Figure 3 is submitted herewith. No new matter has been added. Accordingly, for the reasons stated above, Applicants respectfully request the objection to the drawings be withdrawn.

The objection to the specification is respectfully traversed. Paragraph [0029] has been amended to correct a typographical error therein. Specifically, paragraph [0029] at line 10 has been amended to recite "inductive ratio measurement 204." Accordingly, for the reasons stated above, Applicants respectfully request the objection to the specification be withdrawn.

The objection to the specification because an explanation of the correlation between the parallel impedance and the parallel impedance gap is not provided is respectfully traversed. Figure 3 illustrates an exemplary look-up table of parallel impedance gap versus inductive gap that is empirically derived. Figure 3 does not illustrate a relationship between the parallel impedance and the parallel impedance gap. Accordingly, for the reasons stated above, Applicants respectfully request the objection to the specification be withdrawn.

The objection to the specification because the operation of impedance measurement at three frequencies is unclear is respectfully traversed. The method of generating the look up table is described in paragraph [0029] and at paragraph [0029], lines 6-13, the use of three frequencies is explained as:

> [i]n the exemplary embodiment, system 10 is configured to drive transducer 12 at three different frequencies, each frequency being generated by a different programmable DDS 72. Substantially simultaneously with the inductive ratio measurement 202, system 10 also measures 206 a respective parallel impedance of cable 15. The average of the inductive ratios measured at each frequency is computed 208 and correlated 210 to an inductive gap value. Each measurement may be plotted 212 such that a curve of respective parallel impedance values versus the corresponding inductive gap is defined. In one embodiment, the results of each computation are plotted on display 150 in a textual format. In the exemplary embodiment, the results are displayed in a graphical format.

Two frequencies are used to compute inductive ratio to facilitate removing unknown terms in a system installed on a machine that is operating and unable to be disassembled. The specification describes at paragraph [0031], lines 1 and 2 that "an initial step of the inductive ratio measurement is to measure the impedance of cable 15 and transducer 12 at two different frequencies f1 and f2." The impedance at two different frequencies is used to determine the inductive ratio such that unknowns are canceled. Accordingly, for the reasons stated above, Applicants respectfully request the objection to the specification be withdrawn.

The objection to Claim 5 is respectfully traversed. Specifically, Claim 5 has been amended to recite "averaging at least one of the inductive ratios" as suggested in the Office Action. Accordingly, for the reasons stated above, Applicants respectfully request the objection to Claim 5 be withdrawn.

The rejection of Claims 1-8 under 35 U.S.C. § 102(b) as being anticipated by Slates (U.S. Patent No. 6,346,807) is respectfully traversed.

Slates describes a digital eddy current proximity system (10) that includes a proximity probe (12) for digitally measuring an impedance that is relative to a gap defined between the probe and a metallic target (T) being monitored. The system also includes a signal generator means (70), a timing control means (80), a sampling means (90), a digital convolution means

(100), and a digital signal processor means (110). The signal generator includes a plurality of direct digital synthesis devices (72) that are coupled to a resistance means (40) via a filter means (50) and a buffer, gain, and offset means (60) for driving a plurality of dynamic signals at different frequencies through the resistance means and the probe and for obtaining simultaneous impedance measurements of the probe at different frequencies relative to the gap. Notably, Slates does not describe nor suggest determining a plurality of complex impedance values of the transducer at each of the plurality of frequencies, determining a plurality of gap values using the data structure and the plurality of complex impedance values, or determining the gap using the plurality of gap values.

Claim 1 recites a method of testing a cable including "measuring at least one inductive ratio for the cable...determining an inductive gap from the at least one inductive ratio...measuring a parallel impedance of the cable...determining a resistance of the cable based on the inductive gap and the parallel impedance."

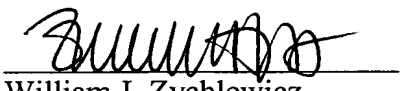
Slates does not describe nor suggest a method of testing a cable as recited in Claim 1. Specifically, Slates does not describe nor suggest determining a resistance of the cable based on the inductive gap and the parallel impedance. Rather, in contrast to the present invention, Slates describes, with reference to Figure 20 that an initial step of the inductive ratio method is to measure the impedance of the probe at two different frequencies f_1 and f_2 wherein the impedance at f_1 is X1=(R1+jwL1) and the impedance at f_2 is X2=(R2+jwL2) and then calculating the normalized impedance using R1n=(R1-r1)/w1l1 w1L1n=w1L1/w1l1 for X1 and R2n=(R2-r2)/w2l2 w2L2n=w2L2/w2l2 for X2. Slates also notes with reference to Figure 20 that "the resistance is unreliable and therefore, the focus will be on the reactance measurement." Moreover Figure 20 is based on the normalized impedance response and does not illustrate the inductive gap and the parallel impedance. As such, Slates does not describe nor suggest determining a resistance of the cable based on the inductive gap and the parallel impedance. Accordingly, Claim 1 is submitted to be patentable over Slates.

Claims 2-8 depend from independent Claim 1. When the recitations of Claims 2-8 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 2-8 likewise are patentable over Slates.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1-8 be withdrawn.

In view of the foregoing remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully requested.

Respectfully Submitted,



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